413.1
4P0-b

FILE COPY FOREST INSECT LABORATORY, UNIVERSITY OF CALIFORNIA, BERKELEY CALIFORNIA.

JMM
MLL
KAS
GEDL
GRS
HSM
ASW
JWB
CBE
RCH
JCY
WTC
POJ
ESS

MEMORANDUM ON DROUGHT INJURY TO REPRODUCTION IN THE ROGUE RIVER VALLEY DURING THE FALL OF 1936

By
R. L. Furniss
Assistant Entomologist
Forest Insect Laboratory
445 U. S. Court House
Portland, Oregon
September 20, 1938

Copy for information of Mr. Miller

MEMORANDUM ON DROUGHT INJURY TO REPRODUCTION
IN THE ROGUE RIVER VALLEY DURING THE FALL OF 1936

In a letter dated May 18, 1937, Mr. G. E. Mitchell, Supervisor of the Siskiyou National Forest, requested information concerning dying trees at Gasquet Ranger Station, California. Larvae of Monochamus obtusus from the dead trees were sent to the Forest Insect Laboratory and a letter from Mr. Lowden, the district ranger, was quoted concerning the insects, as follows:

"Beetle infestations in the second-growth Douglas fir at Gasquet are causing us serious concern. It appears that if we do not stop the present spread of these insects all of the Douglas fir trees on the station and picnic grounds and surrounding area will be killed.

"We have been cutting out and burning the trees as they showed signs of beetle work and plan to make a still more vigorous campaign of this kind.

"Infestations are confined principally to the locality approximate to the ranger station but even now if we should cut out all the infested trees in this area it would constitute considerable work. More than 50 percent of the trees on the station grounds have been infested and cut out. On the highway department administrative use a still higher percentage of the trees are infested.

"It was thought that with increasing spread of their work it might be desirable to secure expert advice as to the likely spread of the beetle and as to the best methods of control."

In response to Mr. Mitchell's request, three trips were made to the area. As a result of observations from May 21 to 25, 1937, it seemed advisable to consult with the Office of Forest Pathology. Accordingly, on June 10, 1937, a reexamination was made in company with Drs. J. L. Bedwell and T. W. Childs of that office. On July 13, 1938, the area was visited again. The following is a discussion of the findings:

Dead and dying trees were noted at many places in the spring of 1937. In fact, the condition was prevalent throughout the valleys and lower slopes of what might be called the Rogue River climatic sub-region. Killing was most abundant near Trail; on the lower slopes south of Bear Creek and the Rogue River between Ashland and Grants Pass; in the low foothills surrounding Grants Pass; and along the Redwood Highway near Wonder, Cave Junction, and Gasquet. Some killing was noted along the Pacific Highway nearly as far north as Canyonville, along the Rogue River west of Grants Pass to Galice Ranger Station, and along the Applegate River near Provolt.

Douglas fir, incense cedar, sugar pine, madrona, and manzanita were all affected and about in the order named, with Douglas fir suffering decidedly more than the other species.

The type of damage on Douglas fir was characteristic of that on all species. On those trees that were affected least, only the last few years of terminal growth was killed (see fig. 1), while the

most serious condition was one in which the entire tree died. Trees from seedling size to over 50 feet in height were affected, although damage was most severe to trees less than 25 feet high. There was a tendency for the damage to occur in groupwise fashion.

Trees were felled and examined at several places to determine the cause of death. Nearly without exception these trees showed no primary attacks by insects or fungi. Insects and fungi were found to be present in some of the trees but in nearly all cases their presence was the result of some primary weakening influence which caused decreased vigor of the trees. The characteristic condition was one in which there was a dying back from the top resulting from desiccation.

Since the damage appeared to be physiological, a search was made for the possible cause. Two things, low temperatures and drought, were immediately suspected. Low temperatures were eliminated because the type of injury was not characteristic. Winter injury usually affects trees predominantly on one side, the side toward the prevailing winds or the side toward the sun, i.e., the south. Winter injury would hardly exist over the wide topographic range that the damage occurred in the Rogue River Valley. Furthermore the first evidences of damage were noted in the fall of 1936 before cold weather had begun. Actually on some of the higher slopes south of the Rogue River there was some winter killing of foliage of knobcone and sugar

pine on exposed serpentine ridges. This is not to be confused with the other type of injury that occurred in the valleys.

A study of the precipitation record brought out some interesting facts. Taking Grants Pass as an example, there have been 25 years since 1889 in which the annual rainfall has been less than in 1936 (see Graph 2). In fact, the annual rainfall for 1936 was exactly normal for the period 1889 to 1937 inclusive. From this it is apparent that there was little if any correlation of tree killing with annual precipitation.

Since moisture deficiencies are likely to have their greatest effect during the growing season, at which time the rate of transpiration is greatest, it was decided to examine the precipitation record for that period of the year. Again taking Grants Pass as an example, the accompanying Graph 1 shows that the normal rainfall gradually decreases from about five inches in January to practically nothing in July and August. The fall rains begin in September and from that time on the amount of rainfall increases rapidly until midwinter. In 1936 precipitation was normal or a little above through the month of August. In September there was a light rainfall followed by two bone-dry months of October and November. An unprecedented long fire season resulted, which for a time threatened to keep the fire-fighters in the woods until Christmas. This prolonged dry weather caused a remarkable deficiency of precipitation. By referring

to Graphs 3 and 4 it can be seen that the precipitation for Grants Pass in September and October 1936 was 11 percent of normal, and for September, October, and November 1936 only 5 percent of normal--and this was after the two dry months of July and August.

Soil profiles in cuts along highways showed that bedrock was near the surface, especially where considerable mortality of reproduction had occurred. At other places, for example Gasquet Ranger Station, the trees were growing on gravelly soil. Under both of these conditions the effects of drought would soon become evident.

Several species of insects attacked the drought-weakened trees. The larvae sent in by Ranger Lowden were Monochamus obtusus Csy., commonly known as a pine sawyer. These beetles attack seriously weakened trees, windthrown trees, and recently cut trees. They were quite abundant in the larger trees, both the top-killed ones and the ones that had been killed outright. Several bark beetles attacked the living portion of top-killed trees and their work undoubtedly killed many trees that otherwise would have survived. The more important species in this group were Scolytus oregoni, Blkm., Pseudohylesinus nebulosus, (Lec.), Pseudohylesinus grandis Sw., and Carphoborus sp. Cylindrocopturus longulus (Lec.) killed lateral branches up to one inch in diameter. Pissodes fasciatus Lec. and Callidium sp. attacked the more seriously weakened trees.

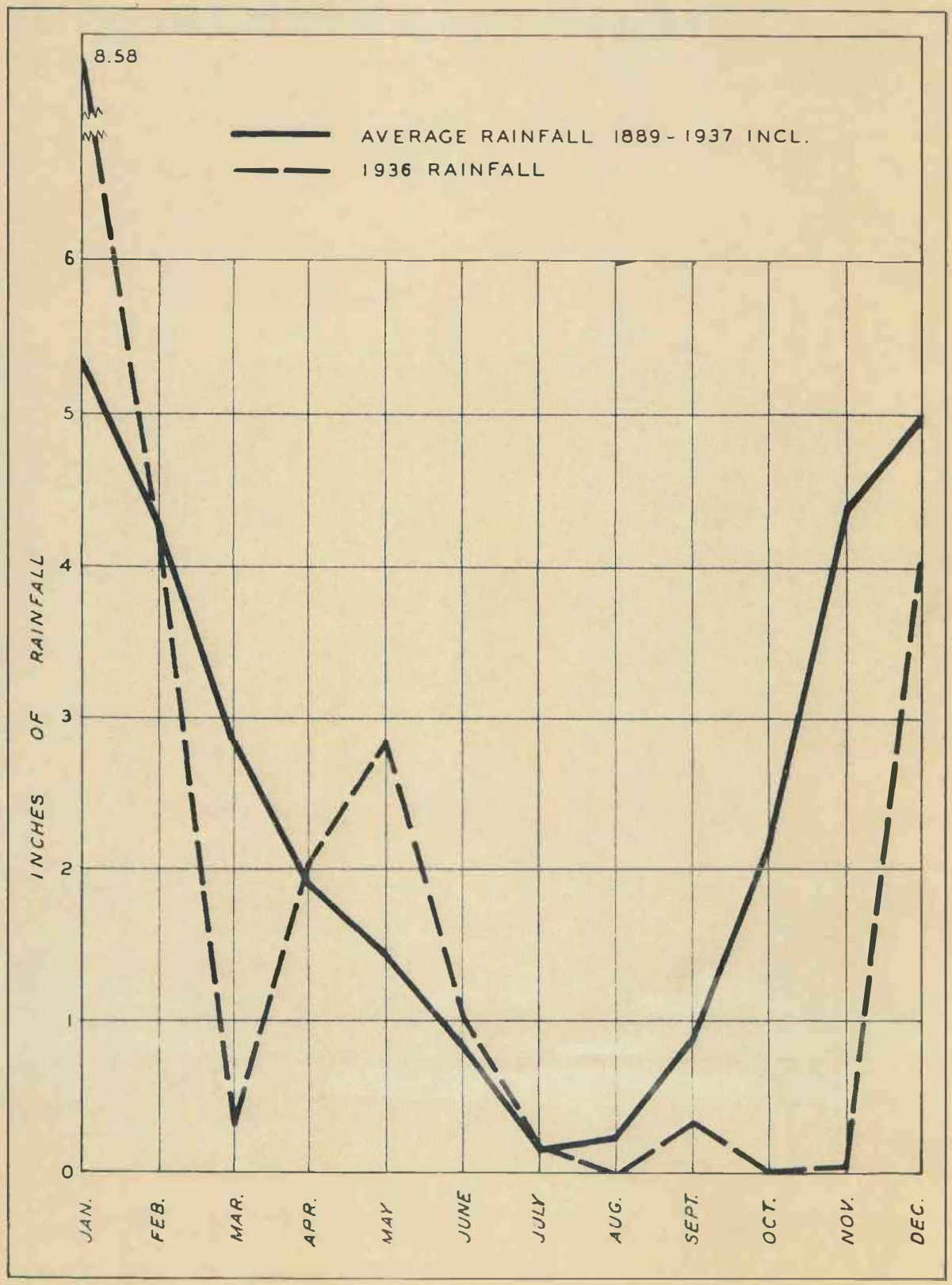
Reexamination of the affected area on July 13, 1938, revealed that killing of the trees had almost entirely subsided. Monochamus larvae were found in several dead and top-killed trees but no active bark-beetle infestation existed. It is evident that the trouble is at an end at least until there is a repetition of similar climatic conditions.

There are two other instances of this type of killing in the Rogue River drainage. One occurred in the period 1914 to 1916, at which time there was a marked precipitation deficiency for September and October. Again in 1929 and 1930 there was a recurrence of the killing, notable chiefly in Douglas fir. During the earlier period, when a forest insect laboratory was located at Ashland, Ore., numerous secondary bark beetles were found taking over a primary role. In the 1929 to 1930 period the injury extended down the coast range well into California, according to reports of the Office of Forest Pathology. At that time certain fungi developed abundantly on the weakened trees but no record of insect-caused damage was obtained. At present it is possible to pick out many of the trees that were top-killed in 1929 by the presence of a crook in the bole where a lateral took over the place of the terminal that had been killed.

R. L. Furniss,
September 20, 1938.

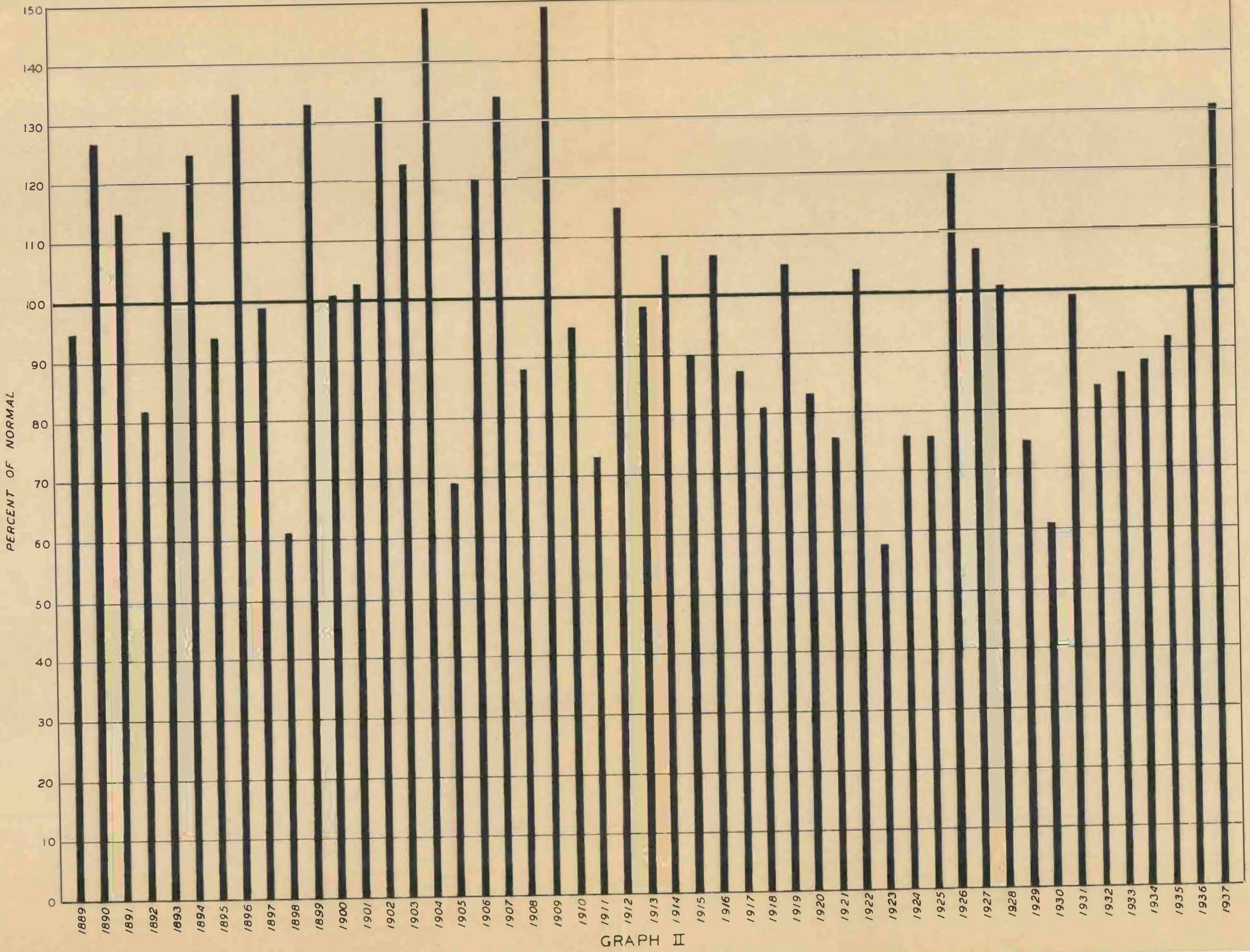
Figure 1.

MONTHLY PRECIPITATION
GRANTS PASS, ORE.



GRAPH I

ANNUAL PRECIPITATION FOR GRANTS PASS - 1889 TO 1937 INCLUSIVE



GRAPH II

PRECIPITATION IN GRANTS PASS ORE. FOR SEPTEMBER AND OCTOBER - 1889 TO 1937 INCLUSIVE

358

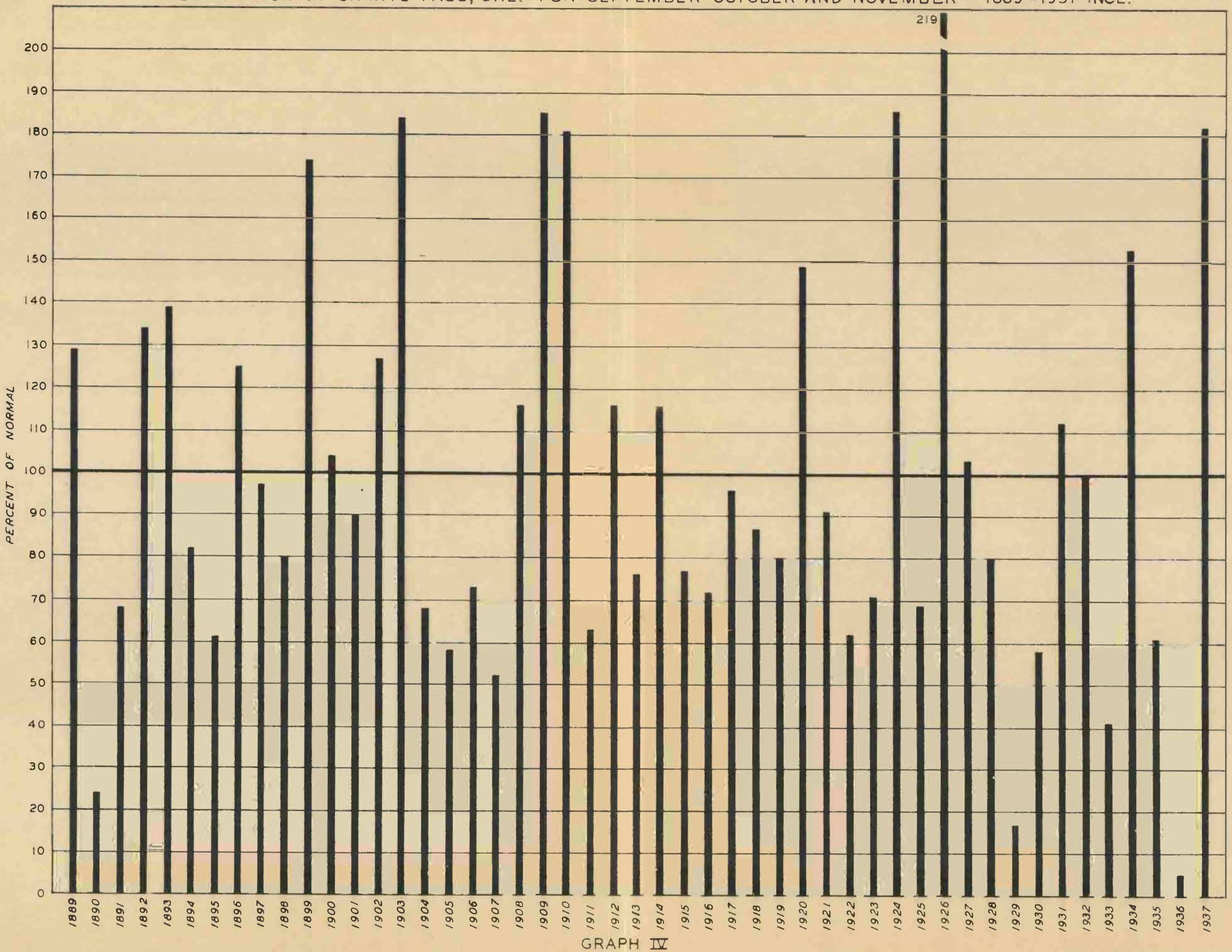
PERCENT OF NORMAL

200
190
180
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0

1889 1890 1891 1892 1893 1894 1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906 1907 1908 1909 1910 1911 1912 1913 1914 1915 1916 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937

GRAPH III

PRECIPITATION IN GRANTS PASS, ORE. FOR SEPTEMBER OCTOBER AND NOVEMBER - 1889 - 1937 INCL.



GRAPH IV